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Chapter 09: Purposes for Educational Research

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Abstract

Educational research is remarkably diverse in terms of the methods employed and the paradigms within which researchers operate. Each of the methods has specific purposes and each of the paradigms brings with it particular views of the world usually from other disciplines. But all aim to improve education in their various ways. This might involve developing better insights into how teachers work together in a school or evaluating the impact of a particular policy or designing a better way to teach a

particular topic. It includes advancing theoretical perspectives which can make sense of findings and lead to better insight, better research and better education. Occasionally, educational research might involve the unearthing of fundamental understandings in the natural sciences sense, for example, the study of how children learn, or fail to learn, to read may give us an insight into the workings of the brain, but that is unusual and should not be the prime focus. Educational is a science of the artificial, to use Herbert Simon's term, and as educational researchers our purpose is to improve education.

Keywords

Purposes, impact, applied, design, educational research,

Introduction

Education is an artificial system (Simon, 1988) created by people and educational research should continually strive to improve that system. Research in the discipline of education is not about the fundamentals of philosophy, statistics, psychology, sociology or genetics, but rather about finding ways to improve how we learn and what we learn. It might seek, for example, to describe some aspect of education such as activity in the classroom, or problematise a politician's claim or establish the correlates of failure in examinations. These activities may or may not improve education, but if that is not their ultimate aim, then what is their purpose? To gain qualification or status for the researcher? To gain academic insight for its own end? To move up the university league tables? To justify a politician's policy? All these and others, are certainly purposes for educational research, but if we look behind the immediate aims and behind the rewards and ask about its ultimate purpose, it has to be to improve education.

That improvement might come about in many ways, for example, we might directly investigate whether approach A to teaching reading is more effective than approach B, or we might ask what the school experience of being labelled with a diagnosis of a disorder such as ADHD feels like, or we might ask if delaying the age of starting school helps children in the long run, and so on. In each case, we are exploring how education can be improved.

Advance organiser

This chapter builds the case for and elaborates the assertions in the last two paragraphs by first outlining the aspirations and perceptions of some selected researchers and then giving a position statement which sets out the author's ontological views. This is followed by an extended analogy which aims to show how a single topic can attract the interests of a very diverse set of researchers with varying mind-sets and purposes. In trying to make sense of the diversity of disciplines attention is then directed at Herbert Simon's work, as providing an overarching structure and direction. The implications are then explored and, recognising that there are multiple purposes for educational research, a hierarchy of purposes is proposed. This is followed by a section which seeks to make more explicit the links between methods and purposes which two examples of chosen methods. Finally, the chapter is drawn to a conclusion with a call for more working together across disciplines.

Differing perception

A thoughtful overarching position was taken by Kerlinger (1973), in which he set out the case for the scientific approach. For him, the aim was to use the scientific method with the clear goal of creating theory "*the ultimate aim of science*". Such a grand

aspirational aim lies behind the development of the Tool Kit (Higgins et al, 2014), a synthesis of research on the impact of educational interventions and also a way to help schools spend their money wisely (<http://educationendowmentfoundation.org.uk/>). But the use of scientific procedures in educational research has been dismissed with the insult “*positivist!*”, a term that refers back to a philosophy of the nineteenth century which has been rejected by mainstream natural scientists such as Heisenberg (1991), but the word continues to be used, often inappropriately, when describing quantitative educational research.

Unfortunately, for those who reject the scientific approach and for those who argue that more research will not allow us to establish universal education truths, we have evidence for both: we have examples of meaningful theory and have shown that educational truths are not always eternal. The former comes from the remarkably extensive work on reading (summarised by Elliott & Grigorenko, 2014). They synthesise work from psychologists, educationalists, geneticists and neuroscientists giving teachers a solid evidenced-based theoretical base from which help for those who struggle to learn to read can be constructed. Evidence for the latter has been building up over time, but two recent papers (Slavin et al, 2014 and Lemons et al, 2014), show that apparently well-established interventions do not consistently work across countries and over time. The paper by Slavin et al recounts how a previously successful intervention involving cooperative learning in the USA simply did not work in the UK, despite two serious efforts using randomised control trials. They comment that “*Teaching methods proven to be effective in one culture and system cannot be assumed to be effective in another*”. The work on Lemons et al involved peer tutoring experiments repeated over several years which unexpectedly did not work after a series of successes. They ascribed

the finding to “*the changed context*” and wrote about the impact of “*the change agent - a no-nonsense Chief Instructional Officer*”.

An additional purpose for educational research was set out by Simon (1988); creating systems that work. If, as educational researchers, our ultimate purpose is to improve education, then one way to do so is to create working systems. One significant example is provided by the A Level Information System project created by Fitz-Gibbon (1996), which led to a series of very successful monitoring systems for schools to evaluate the effectiveness of their own practice on students’ progress and outcomes (Tymms & Coe, 2003). Interest has expanded in this way of working under the general heading of Design Research (Kelly, 2003 and Plomp, 2009).

In summary, the main purpose for educational research must be to improve education. That research may aim to analyse, describe or explain through various approaches but it may also be concerned with design. This might be the design of a teaching programme, an assessment system, a curriculum or an out of school activity. In each case, the aim is to improve the education of children.

Position statement

When writing about the purposes of educational research, it seems appropriate to start by setting out what the author sees as the nature of the social world; in other words, to make an explicit statement about ontological belief. Educational researchers vary enormously in their stances and in what they write about the positions of others. This can vary from the caricatured extremes of positivism to an apparent belief that the world is entirely socially constructed. Between these, there are a range of views which are outlined below by analogy. But from the outset, I note that I believe in neither of these extreme positions which are of course incommensurate (Pring, 2000 and Coe, 2012) and

which can distract us from a more pragmatic discourse; educational research is nothing, if not pragmatic.

Two extremes

The social world cannot be understood in the way that Isaac Newton was able to understand the movement of the earth around the sun. His was a staggering achievement, building on the data and the insights of others (Koestler & Butterfield, 1968). He was able to show that the same force which causes an apple to fall to the ground dictates the path of our planet around its star. He did this from a series of propositions and equations, generating a whole new branch of mathematics in the process. It is these advances, which allow us to predict eclipses to within a fraction of a second millennia ahead. But, Newton was aware that the solutions to his equations applied best to the problems involving two objects and that even with three, the solutions to the equations are not simple. In fact, as interactions occur, so do complications and the possibility that scientific chaos will ensue (see for example Gleick 1988) making prediction impossible even if the system obeys deterministic laws; a tantalising paradox. Of course, such unpredictability is not a problem for much of the movement of the massive bodies of our solar system where distances are large and near interactions are relatively rare but it is close at hand on a pool table. Even on a hypothetical perfect table with completely spherical balls the position after just a few impacts becomes unpredictable because tiny perturbations in the initial conditions take over the evolving system. In the social sciences, we need to take scientific chaos more seriously than we have to date, although there are strong movements to incorporate the insights which its study have generated (see for example Smith & Thelen, 2003). With these ideas in mind, I thought that I recalled the great Michael Scriven stating in a

Keynote that “*The purpose, and the ultimate purpose, of educational research is to produce low level generalisation and explain them in an informal fashion*”. But an internet -search failed to confirm my recollection and an email produced this response: “*That's an interesting quote, which sounds like something I'd say if it were a discussion: if it were for publication, I would have had to note that I believe there are some exceptions to this low-level generalization.*” (Scriven, 2014).

At the other extreme, is the view that the world is socially constructed. Note that this is not simply a claim that there are differing views, but that there is no reality *per se* (Fairhurst & Grant, 2010). A well-argued case is made for this proposition and it is clear we can doubt everything except our own existence: “*cogito ergo sum*”, as Descartes concluded in the charcoal burner’s hut. Similarly, we can make a case that simply because the sun has risen every day for 4,000 million years, it does not follow that it will rise tomorrow (Ng, 2005). But I continue to live my life assuming that it will. I side *mutatis mutandis* with Samuel Johnson, who railed against Bishop Berkley’s “ingenuous sophistry” by kicking a stone and saying “I refute it thus”. It is quite clear to me and I believe to most social scientists, that there is more substance to the world than that which is socially constructed. This is not to deny that there are different perceptions, even of a single incident and that those perceptions impact on the world, but it does not mean to say that, the world does not exist except in the mind.

I see the world as being based on a series of fundamental laws which are the province of physics and that these fundamental laws have dictated the nature of substances, from which our world is made. The study of these substances is the province of chemistry. From some of these substances, life evolved over the last 3.5 billion years on earth and much of this story is now becoming clear through the work of geneticists, biologists and

others. We are merely one example of this life albeit with extraordinary brains. Our mental processes and states in all their complexity have been studied by psychologists whilst society, formed from groups of people, is the basis of sociological research. Generally, and perhaps surprisingly, the various researchers and disciplines mentioned above have little to do with one another. It is even rare amongst proximate disciplines where it might be expected that sociologists would regularly refer to psychologists, or psychologists to biologists. By contrast, education departments in universities are quite likely to include an eclectic mix of psychologists, sociologists, historians, philosophers, economists and many other disciplines. They all study education often using their disciplinary perspectives and do, occasionally, collaborate¹.

An analogy

If the world is not predictable, despite being the product of fundamental deterministic laws of nature, and if it is not simply in the eye of the beholder, how are we to perceive it and how might we study it? One way to start thinking this through is by using an inevitably imperfect analogy; studying education can be likened to studying rivers and streams. There will be some who might want to measure the water; its temperature, flow, depth and density. These measures might be related to known laws. For example, as the river flows down steep canyons the potential energy gets converted to heat and the changes can be satisfyingly modelled and predictions made. But others, might want to look at the flow of the water using a quite different qualitative lens, noting differences between fast running streams around cataracts and slow moving shallows and theorise about the a life of the river starting with the young stream with its fast bubbling brooks in high altitudes and then into the slow, moving middle age and finally,

¹ One reviewer of this chapter commented: “it is when these disciplines do not co-exist in a department that you get an insular view of small scale education research dominating”

into slower moving old age as it comes to the sea. Such ideas might lead to aesthetically pleasing accounts involving the many shades of colour and the sounds generally by water flow. There will also be those who feel that their best way of studying the water is to become part of the river itself by jumping in and to study from within; to get an idea of how it feels to be water and, so far as it is possible, to become at one with the river. Yet others would claim that you cannot really understand the river without knowing its history. They might look at the paths formed by the water and build up layers of maps which allow us to see the different paths over the years. Or they might try to establish a history of the river through oral accounts and historic record. This could include comparing the river with other rivers. All these different ways of operating, or studying are trying to make sense of what is going on.

Quite different groups will want to influence the way that the river behaves. Perhaps they want to avoid destructive flooding, improve the water quality, use the river's power to generate electricity or create a way in which the water can be released in a controlled fashion to irrigate crops efficiently. These groups would be advised to take cognisance of the research findings of the workers described in the previous paragraph – they need the knowledge – but their purpose is to change and improve, not to describe and understand. This improvement might also be to the river itself, to improve the quality of the water and the ecosystem that it supports.

There is, of course, a limit to the extent to which this analogy holds but it does illustrate various approaches. The researchers might come together and share their work, although it has to be acknowledged that different researchers might find that they were talking across each other even though they were all studying the same phenomenon! For many of the methodological approaches, there is no inherent purpose to studying the

river other than to understand, but for those who would influence the river there are pre-stated purposes. These two positions (trying to understand and trying to change) are explored in the next two sections with a firm stance being taken for educational research.

Sciences of the artificial

In Herbert Simon's book, "The Sciences of the Artificial", he outlines science in its traditional sense of physics, chemistry and biology which are natural sciences; the scientists working in these disciplines study and develop knowledge about objects and phenomena in the natural world. He distinguishes this natural science from sciences of the artificial. Although he notes that "artificial" can have pejorative meanings, he argues that if artificial is taken to mean "made by people" then there really is no problem. There is nothing pejorative in something which is created by people and which can, after creation, take on a life of its own as does a railway, a smartphone or a school. His focus is on things which can be designed. *"If we are talking about the artificial, we are thinking about things that are made, synthesised by people. They might imitate what happens in the natural world, not be of things of the actual world so that artificial things have function or goals or adaptation"*. Artificial systems are likely to be so complex that, even though their basic structures may be fully understood by the sciences of the natural world they must be independently studied by scientific procedures. It follows that in order for an artificial system to be understood, it has to be created. For example, you must study the workings of computers to understand them rather than assuming that you will understand how they will work by looking at the well-understood hardware with logical algorithms. He hypothesises that there will be general laws that can be applied to these artificial systems.

Simon also sets out ways in which university curricula could be developed to study the sciences of the artificial and asserts that it is necessary to move in that direction with more formal and theoretical ways of thinking. Writing originally in 1969, he regretted the tendency for the natural sciences to occupy such a high place and thought that studies of the artificial had apparently suffered. This meant a general downplaying of studies such as journalism, library science and engineering whilst they themselves attempted, in a search for respectability, to mimic the natural sciences; *“the sciences of the artificial is always in danger of dissolving and vanishing and peculiar properties of the artefact, lie on the thin interface between natural laws within and natural laws without”*. Whilst natural sciences are concerned with how things are, the artificial sciences should be concerned with how things ought to be, hence the emphasis on a science of design. There was already an extensive body of knowledge to help establish such disciplines but much has yet to be done. Great designs will not be perfect and he introduces the word “satisficing” to underline the impossibility of perfect solutions. To satisfice is to do just what is necessary to solve a problem. What is needed, is something which is good enough, something which satisfices.

Of course, the university scene has evolved since the time of the first edition of Simon’s work, but has it changed radically? Do we have education departments with a coherent focus on the science of education? To what extent do we seriously seek to design new and better systems? Do we still want, in our own ways, to emulate the disciplines from whence we came?

Pasteur’s’ quadrant

Stokes (1997), formulated what he termed “Pasteur’s quadrant” which (Figure 1) neatly categories research according to whether it was based on a quest for fundamental understanding and what the initial consideration of the use of the research was.

Figure 1: Pasteur’s quadrant

		Consideration of use?	
		No	Yes
Quest for fundamental understanding?	Yes	Pure basic research	User-inspired basic research
	No		Pure applied research

The top left hand quadrant corresponds to Simon’s natural sciences and Stokes characterises this with the work of the physicist Neils Bohr. The top right hand quadrant is exemplified by the microbiologist Louis Pasteur, whose work was aimed at practical uses but involved developing fundamental understanding. The bottom right hand quadrant corresponds neatly with Simon’s sciences of the artificial and is characterised by the work of the inventor and businessman Thomas Edison. Educational research also fits into that box with one proviso which is provided by Beckmann (2015). Beckmann uses the quadrants when thinking through the direction of psychological research. He argues that some of the work of psychologists, working in an applied discipline such as education, is aimed at use and inevitably, advances fundamental understanding. In this, he is surely right.

Implication

Both Simon’s Sciences of the Artificial and Stoke’s formulation have implications for educational research and its purpose. The first point is, that educational research can be

considered to be a science of the artificial, which needs to focus on use and which can/should draw on the natural and other sciences and, in particular, on psychology and sociology whilst using tools derived from other disciplines such as medicine, ethnography, statistics and economics. Its purpose is not to search for fundamental understanding in the natural sciences sense, rather it should draw on fundamental understandings which have been established elsewhere. But it can be that the effort to improve education does advance fundamental understanding in a field such as psychology.

The second is that improvement might involve the designing of systems that work well enough, or, better than existing systems. This could be as grand as creating a national assessment system (Black, 1988), or as modest as designing a lesson plan. Each aims to satisfy, none is perfect and each can be improved.

Thirdly, educational research can properly provide feedback to a system or part of the system. This may be as apparently small, but potentially vital, as giving observational feedback to a teacher, or as grand as systematically studying and reporting on standards (Tymms, 2004, Tymms & Merrell, 2009 and Coe and Tymms 2008). It might also involve criticism (feedback) of existing systems i.e. formative feedback (Scriven, 1996).

A hierarchy of purposes

The purposes of educational research can be thought of as hierarchical (Figure 2). At the top level, the ultimate purpose for educational research is to improve education. The second level encompasses the implications noted above and fits well with Newby's (2014) three broad reasons for doing research in education and they are to explore the issues, to shape policy and to improve practice.

Below the second level come more differentiated purposes which start to blend into the methodologies hinted at earlier. That is to say as we move from general purposes we come to ways of doing research and these are usually linked to specific purposes; they include generalised themes such as literature searches, observations and interviews, testing ideas, thinking through the purposes of education, thick descriptions, statistical analyses, creating localised, national and cross-boundary systems. One of these, “thinking through the purposes of education”, occupies an odd position in the hierarchy in that one cannot logically decide how to improve education unless one knows what its purposes are. Again a pragmatic view is taken. There is much agreement about the overall purposes of education (to provide children with basic skills, to enable fulfilling individual lives, to develop people who can contribute to society) but it is nonetheless not uncontroversial especially when the details behind the broad headlines are examined, and thinking in this area should be seen as evolving and potentially influencing our view of what it means to improve education in an iterative cycle.

As an aside, it is worth noting that it is common to see research design tackled in books on educational research and this is often arranged within paradigms (Cohen et al 2000, Newby, 2014, Arthur et al, 2012 and Green et al, 2012). The paradigms might include broadly naturalistic or ethnographic research, correlational research, case studies, historical approaches and interventions; Cohen et al (2000) call these groupings “Styles of Educational Research”. But within the hierarchy research design does not appear *per se*, rather it can be conceived as something which is necessary to the activity of educational research and which should always have purpose(s) in mind. Research design is also the subject of specific texts such as Middleton et al (2008), Gerber & Green (2012) and Creswell (2012).

At the fourth level come the tools of educational research and again many texts, outline a plethora of different research techniques or approaches. Each of those tools is able to answer particular kinds of questions, or rather, it is reasonable to seek answers to certain questions by using their tools. These include questionnaires, interviews, cognitive tests, randomised control trials, observational checklists, meta-analysis and others too numerous to mention. For each of these tools, we must be clear about their purposes, their potential and limitations for educational research.

The hierarchy is summarised in Figure 2.

Figure 2: Hierarchy of the purposes of educational research

1	To improve education									
2	Exploring the issues				Shaping policy: examination of existing systems and practice; envisaging alternatives			Design: creating systems that work		
3	Literature reviews including meta-analyses and systematic reviews	Observations, interviews	Identifying problems	Testing ideas through small scale informal interventions through to large scale clustered RCTs	Examining or purposes of education	Detailed thick descriptions of impact then on individuals and groups	Analyses of the workings through quantitative data including the validity of claims and unintended consequences	National – structures, curricula, assessment	Stand alone: assessment systems, programs of work, text books not restricted to one context	Specific, classroom organisation, lesson planning
4										

Levels 4 includes numerous methods available to educational researchers: too many to list or show in any detail

There is a danger that the purposes of educational research get lost in the methods and the next section aims to make the link between methods and purposes clearer

Research methods

Given the plethora of research methods available to the educational investigator, two very different approaches are set out in more detail, by way of example, to illustrate the kinds of questions (purposes) that can reasonably be asked using the various methods. One involving questionnaires is usually associated with the quantitative paradigms and the second, the ethnographic approach falls into the naturalistic category.

Questionnaires

Questionnaires (see for example Tymms 2012), are responded to online, on paper or possibly on the telephone or face to face. They include a series of questions which can vary quite dramatically, from the very structured to the unstructured using yes/no types of responses to multiple choice, rank ordering, ratings and open ended questions. In doing this, the researcher can be expected to have a fairly advanced understanding of the issues of the topic being investigated. That is certainly the case if one is asking about questions involving rating scales; “To what extent do you agree that ...” which can be answered on a strongly disagree to strongly agree rating. Investigators would be ill-advised to ask such a question without preliminary investigation; this might be a series of interviews, or focus groups or reading the literature where other investigations have been carried out. A significant threat to the research is the possibility that respondents are prepared to give opinions of topics which they know little about or which are not relevant to them. Although, of course, it is accepted that questionnaires can begin in a very preliminary, open ended way and then focus in, with later instruments, as the key questions start to crystallise. Nevertheless, the kind of questions

the researcher seeks to answer would be “To what extent do participants feel that” and then some statement there or “What is the general opinion about” or “What is the estimated likely reaction to ...”. Questionnaires can also be used as an instrument to measure such things as motivation or attitudes. They necessarily follow other theoretical or empirical work, which ascribes the kind of attitudes that we are interested in or the kind of structure behind motivation. It would not be possible or sensible to try to approach those later on.

Questionnaires seek to answer questions about people’s feelings, attitudes and perceptions, having first decided what kind of attitudes and perceptions are relevant and valued. Of course, the open ended questionnaire is less constrained and can be used to develop a structure or theory through the analysis to the responses but even there, the questions that need to be asked need to be based on prior knowledge.

Sometimes, the technique is used to ask people why they did certain things but often they do not know or cannot remember accurately, even when they think they do. This lack of validity of introspection is evident for a number of investigations such as those into memory (McFarland et al 1989) and social judgements (Nisbett & Bellows 1977). Both of these articles are discussed in more detail in Abelson, Frey & Gregg (2014).

But whatever the nature of a questionnaire and whatever the quality of the data it generates its purpose is in embedded the design of the research. Tools have multiple purposes and questionnaires could figure in several of the level 3 purposes in Figure 2. These are in turn linked to the levels above the point being that the specific approaches chosen for educational research should be subservient to the aims. Tools are there to be used for purposes not to define purposes.

The ethnographic approach

The ethnographic approach of gathering information is quite different and is clearly outlined by for example, Anderson-Levitt (2006), Green & Bloome (2004), Rossman & Rallis (2011, Delamont). The guiding principle is that, ethnography deals with culture and that the researcher takes the view of the insider and seeks to understand groups from within. It is about people and how they formed meanings within groups. In other words, culture can be seen as the making of meaning. The researcher does not seek answers to the kind of questions that an evaluator might ask about impact; rather he or she “*seeks understandings of local situations*” (Anderson-Levitt, 2006, page 282). In other words, it describes the real world complexity of human behaviour. It asks: What is going on here? How does this happen? What does it mean? It does not measure variables nor does it test hypotheses. It is often used to tell stories, particularly of the less powerful (Bagley & Castro-Salazar, 2010), but it can also be used to study the powerful. The researcher might work in a field as a participant observer over a very long period of time.

It is instructive to note a passage from the Anderson-Levitt (2006), which gives a clear view of the purposes of the ethnographic approach “*it is an ideal research strategy for seeking to understand real human behaviour in all its complexity and, therefore, provides important background for any research that seeks real and lasting solutions to human problems*” (page 282 emphasis added).

Note that the quote refers to a “research strategy”. The author sees the ethnographic approach not as an end in itself with its own purpose but as something which is subservient to a higher purpose.

Comment [A1]: Chapter in this volume: details to be added later

Conclusion

Educational research is hard to categorise involving, as it does, many different academic disciplines. Indeed, one could be forgiven for not seeing educational research as a discipline in itself. But it can be unified under a single purpose which is to improve education. It can do this by exploring issues, shaping policy and crucially by design – creating systems that work. The methods it uses are extraordinarily diverse and very often they have restricted aims and operate only within well-defined boundaries. Nevertheless, educational research has built and is building an extraordinary body of knowledge and understanding which largely resides within the sub-compartments of educational research, the paradigms. Despite a wide spread recognition that each approach has something to offer and despite important texts showing ways forward (Tashakkori & Teddlie, 2010; Cooper et al, 2012), it remains the case that researchers often remain in their group running their own conferences, writing and reading their own journals. Moreover, there is probably more interdisciplinary interaction within education than is found between say sociology and psychology or between biology and chemistry. But we need more. Improving the education of our children can only be helped by bringing researchers from very different perspectives together. Curriculum design needs the insights of educational ethnographers just as it needs educational psychologists, psychometricians and practitioners. We have a common purpose and we should specifically aim to come together to fulfil that purpose.

Of course it is hard to get academics to agree with one another, not only are they naturally inclined to independent thought but career advancement can be forged by creating new theories and by pointing out the errors of others! But we do not have to

agree with one another to work together. Given a common problem to solve – an educational design issue – researchers can and do come together remarkably well.

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Comment [A2]: Chapter in this volume
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